The International System of Units

a.k.a. "The Metric System"

Countries NOT using the metric system as their official system of measurement:

1

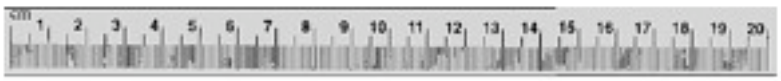
So why use the metric system?

It is based on units of 10. Therefore it is mathematically much easier to work with than the "English" system!

All other countries, except Thailand and Gabon, use it!

EVERY other industrialized country uses it!

It is the unit of measurement for all scientists across the globe.



2

Basic units

Length = meter

Mass = gram

Volume = liter

3

important prefixes:

kilo =	1000 x	k
centi =	1/100	c
milli =	1/1000	m
micro =	1/1,000,000	u
nano =	1/1,000,000,000	n

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boiling point:

100^0 C

373 K

freezing point:

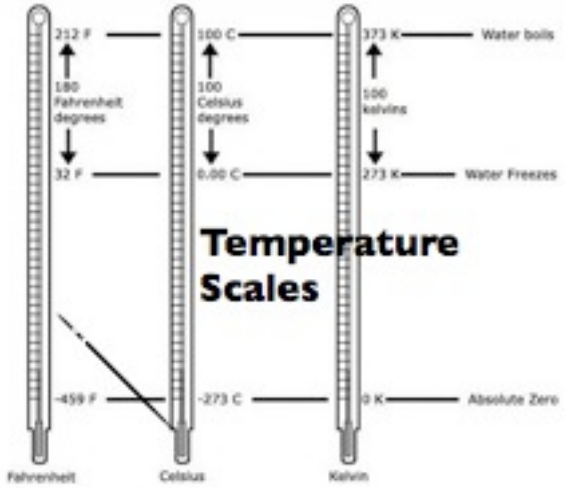
0^0 C

273 K

absolute zero:

-273^0 C

0 K



Temperature Scales

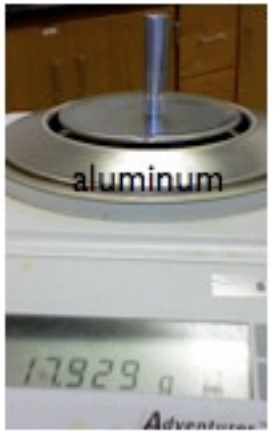
Celsius Kelvin

5

Density = $\frac{\text{mass}}{\text{volume}}$

an intrinsic property

What observation can you make about the densities of steel, copper, and aluminum, based on these pictures?



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Mass

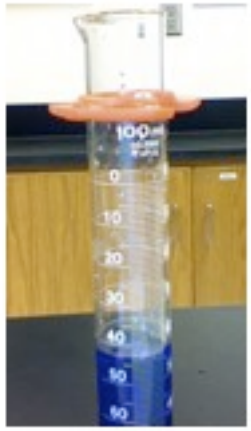
Brass

Calculate the density of brass:

mass = 54.987 g

density = 7.9 g/ml

volume = 57.0-50.0 ml = 7.0 ml



Volume measured by water displacement

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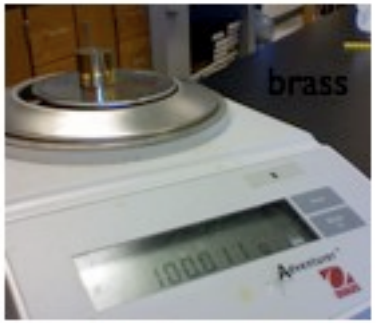

2 objects of the same mass.....

...have different volumes.

What can we say about their densities?

the density of brass is greater than sand

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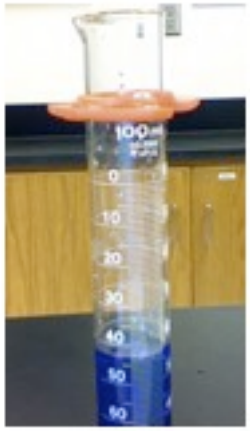
Significant figures

how do we know how to round lab measurements and calculations?



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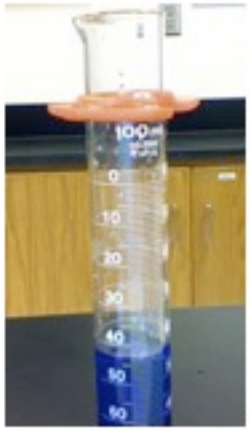
Brass

consider again the density of brass:

mass = 54.987 g

density = 7.9 g/ml

volume = 57.0-50.0 ml = 7.0 ml



calculations are rounded to the like the value with the least number of digits

in this case, volume.

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Calculations made from lab measurements must be rounded to the same number of decimals as the least precise measuring instrument.

Example:

mass measured on a balance = 6.579 g

volume measured in graduated cylinder = 3.2 ml

density = 2.1 g/ml

What if the volume were measured using an instrument that yielded 3.179 ml?????

Then, density of the object = 2.070 g/ml

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SCIENTIFIC NOTATION $1 = 10^0$

$100 = 10^2$ $0.100 = 10^{-1}$

$1000 = 10^3$ $0.010 = 10^{-2}$

$1{,}000{,}000 = 10^6$ $0.000001 = 10^{-6}$

Numbers greater than 1 = positive exponent

Numbers less than 1 = negative exponent

used for really big or really small numbers

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SCIENTIFIC NOTATION REVIEW

- A. $3456.78 \times 10^{-4} = 0.345678$
- B. $3456.78 \times 10^{4} = 34{,}567{,}800$
- C. $0.0345678 \times 10^{-4} = 0.0000345678$
- D. $3.45678 \times 10^{4} = 34{,}567.8$

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$356{,}789 = 3.56789 \times 10^{5}$

$0.0356789 = 3.56789 \times 10^{-2}$

$356{,}789{,}000 = 3.56789 \times 10^{8}$

$0.0000356789 = 3.56789 \times 10^{-5}$

$35.6789 = 3.56789 \times 10^{1}$

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